Claims

Claim 1. The imaging apparatus consists of multiple optical elements of sub-micron, nanometer scale (2) supported onto a partly or fully radiation transmitting layer (3), which in turn is situated on top of a radiation sensitive layer (4) being patterned so that under each optical element there exists at least more than one radiation harvesting element that may be individually affected by radiation.

Claim 2. The imaging apparatus according to claim 1 above, wherein the material of the individual optical elements has a property that causes them to function as lenses.

Claim 3. The imaging apparatus according to claim 1-2 above, wherein the partly or fully radiation transmitting layer (2 or 3) may consist of homogenous material or heterogeneous material, e.g. a layer consisting of fiber, spacer or a fluid or combinations thereof, being malleable by changing its volume, spacing, curvature, other shape change, or chemistry.

Claim 4. The functions of focusing, light filtering, optical correction or zooming as in claims 2 and3 can be achieved by fluidic, capillary force, molecular rearrangement or chemistry,as well as nano-sized levers or fibers to adjust size or refractive property of the optical system

Claim 5. The imaging apparatus in accordance with claim 1-4 above, wherein the optical elements may also be composed of different layers of refractive material enabling radiation of different wavelengths to be manipulated during the path through the optical element to compensate for chromatic aberration effects etc. in accordance with the art of such radiation control by proper choice of lens material. Wherein the material and malleability, in accordance with claim 4, of the individual optical elements and system have a property or properties that cause them to be capable of focusing, zooming, light filtering and optical aberration correction. .

Claim 6. The imaging apparatus according to claims 1-5, wherein the radiation harvesting elements will work as a photoelectric device that will produce an electronic signal.

Claim 7. The imaging apparatus according to claims 1-6, wherein the electronic signal produced can be monitored and/or manipulated by electronic digital processing making an electronic read-out possible.

Claim 8. By image enhancing processing algorithms, overlapping information as described in claim 1-7 above from physically (geometrically) or electronically defined arrays of sensors or "sectors" one can obtain a high resolution image.

Claim 9. Since each of the individual lenses or groups of lenses 1-8 will have a slightly different spatial viewpoint, the multiple information from electronically or geometrically defined multiple sectors of the array of sensors e.g. left and right sector, can be processed to obtain 3-D or stereotypic images.

Claim 10. A digital camera comprising the imaging apparatus in accordance with claims 1-7 above in combination with a shutter layers (1 – 4 and in particular 1 or 4) can be made with dimensions barely visible to ordinary vision or incorporated into either large, micro-sized or nano-sized devices e.g. credit card, button, pin, medical device, etc.

Claim 11. All functional elements of the imaging apparatus and/or camera as described in claim 1-8 above can be made out of various kind of materials and in one implementation be made out of flexible material.

Claim 12. The imaging apparatus in accordance with claim 1 through 9 above, wherein the optical elements may be arranged cylindrically as on a flexible tape, or spherically to obtain wide angle views.

Claim 13. The same information as described above in claims 1-10 can also be used for wide angle view detection by curving the sensor array in a 2-dimensional fashion combined with stitching the information together thereby producing up to 360 degree panoramic imaging.

Claim 14. The same information as described above in claims 1-10 can also be used for wide angle view detection by spherizing the sensor array in a 3-dimensional fashion combined with stitching the information together thereby producing a full 360 degree "fish-eye" imaging capability in all 3-dimensions. Image processing can produce projections known photographically as "fisheye" i.e. circular, rectilinear, or other flat map projections.

Claim 15. One configuration of the imaging apparatus and/or camera as described in claims 1-14 above to obtain color imaging and spectroscopic imaging can be achieved by utilizing equal sized lenses and using multi-wavelength sensing layers below the lenses.

Claim 16. The imaging apparatus and/or camera as described above in claims 1-14 can be employed for spectroscopic imaging and/or spectroscopy taking advantage of the optical properties of nano-scaled lenses by controlling the diameter of the lenses at a nanometer level thereby accepting various wavelengths below the diffraction limit as illustrated in, but not limited by, the two following examples:

A) In one configuration stepwise sized lenses with gradually increasing/decreasing diameter could be employed by utilizing processing to remove the cumulative component of the incrementally larger lenses, e.g. having the smallest diameter lens being capable of admitting only the UV-light waves and the largest diameter lens admitting all wavelengths up to IR-radiation,

B) In another configuration color imaging can be achieved by controlling the diameter of a limited set of 2, 3 or more lenses at a nanometer level. Lenses with different diameters could be utilized to detect discrete wavelengths which subsequently are additively combined to produce a color-code necessary for standard (e.g. RGB, CMYK) or false color processing.

Claim 17. The electronic read-out signal as described in claim 6-9 and 12-16 above, may be electronically processed in many different ways, by delivery to further imbedded processing and storage circuitry, (5-9), or to deliver information to a separate or remote device, which in itself stores information for that can be observed, stored and /or redelivered/re—broadcast.

Claim 18. In one embodiment multiple cameras may be distributed in space and connected to each other and or a central processor by wire or wirelessly enabling retrieval of multiple information. This information can be assembled interferometrically such as a large radio telescope array or to create multiple viewpoints seeing around obstacles. It can also be employed as a tracking device enabling full 3-dimensional capability as well as a "measurement station" making true 3-dimensional metric determination of an unknown object.